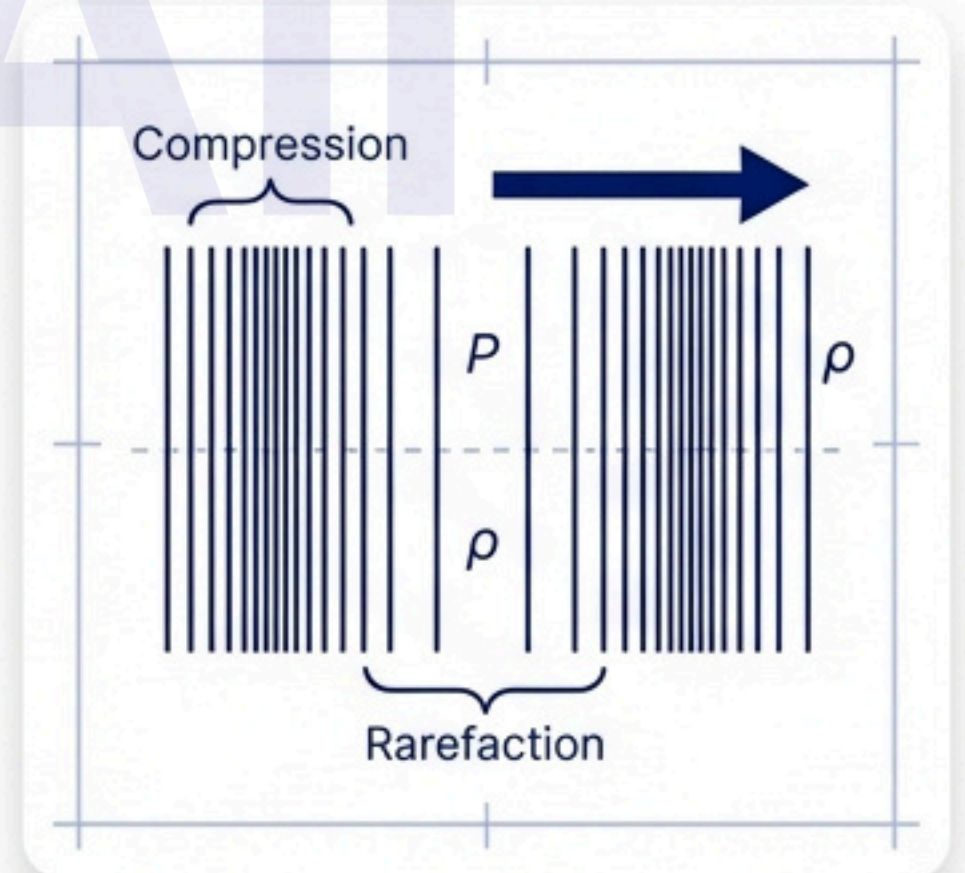
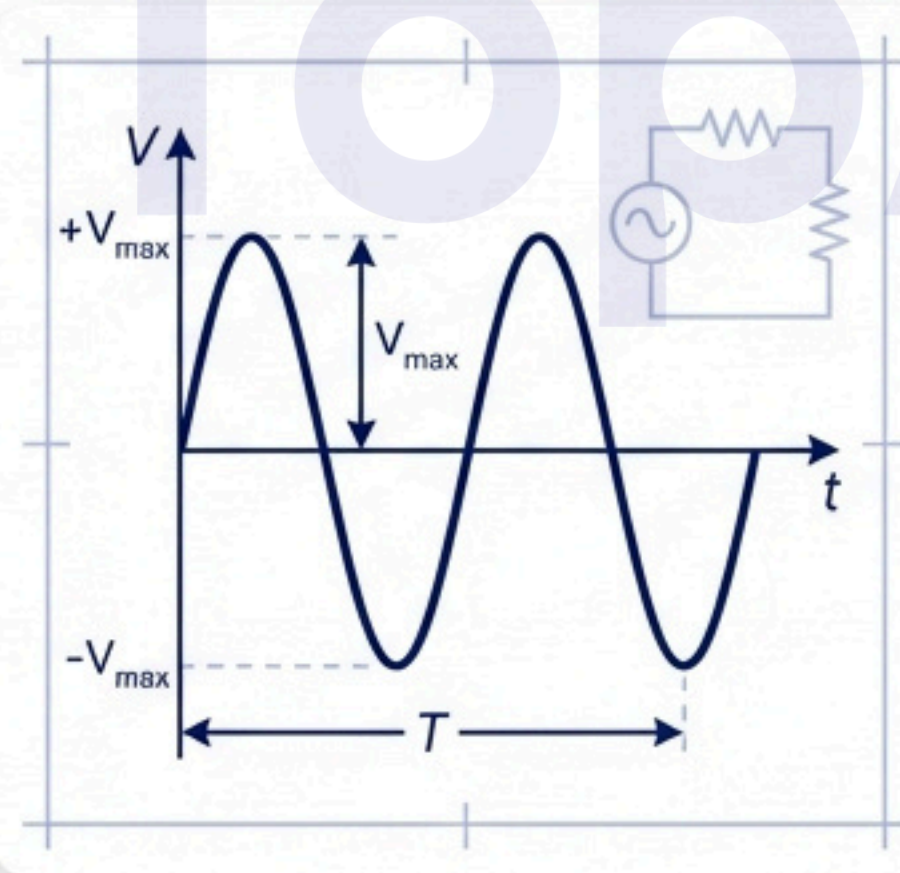
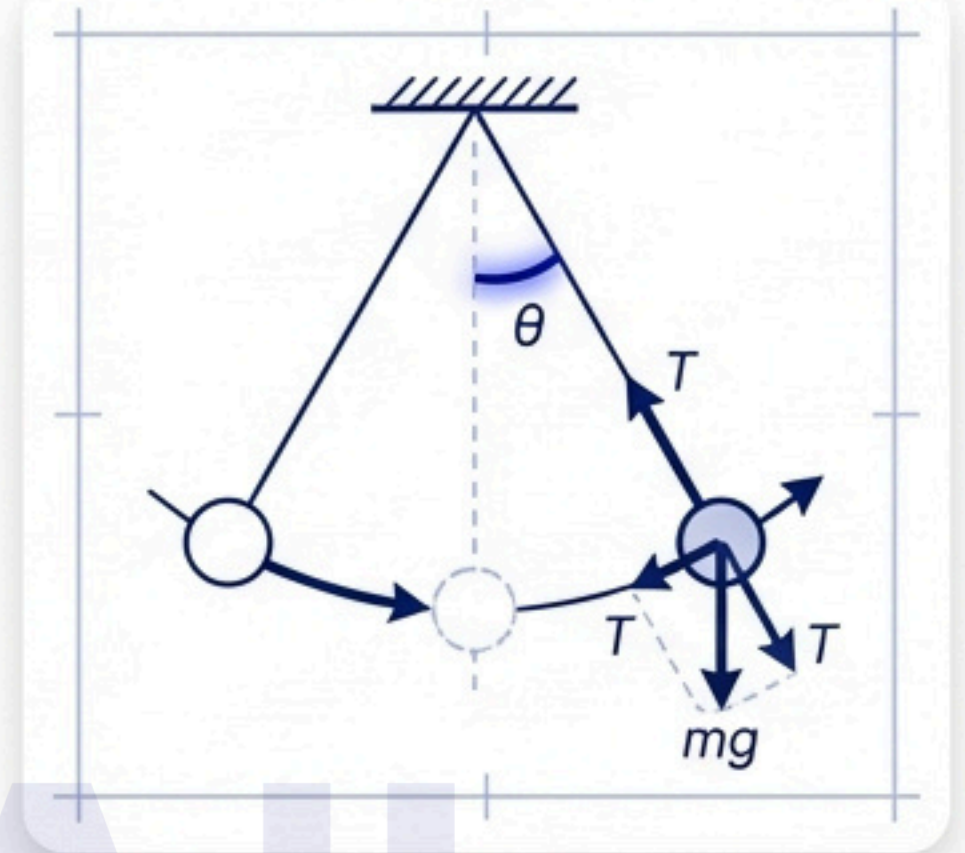
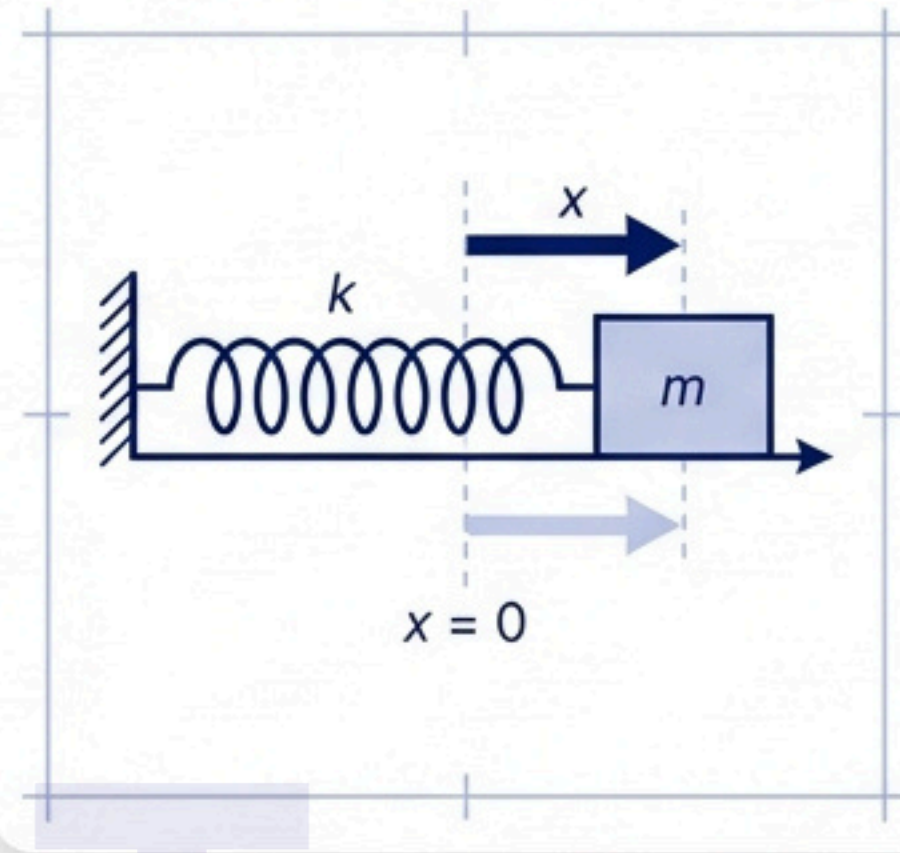


# Displacement in Oscillations

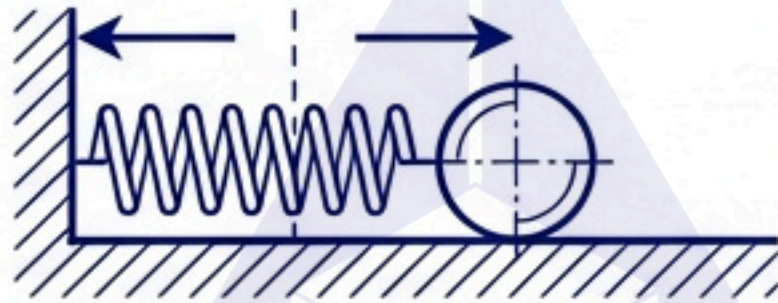
The quantity that swings, shifts, or varies.



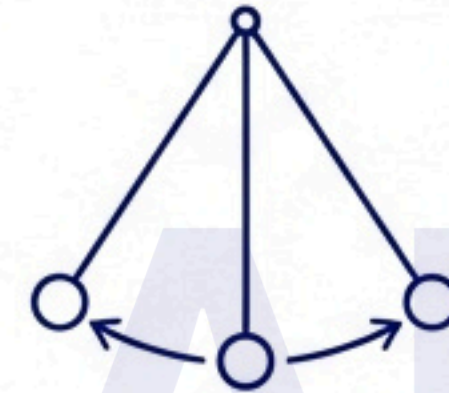
Think broader:

# Displacement Is Not Always Position

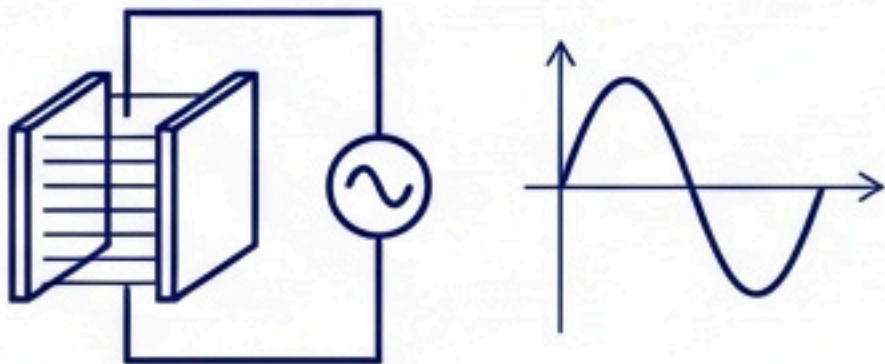
In oscillations, "displacement" refers to the change of *any* physical property over time—not just distance.



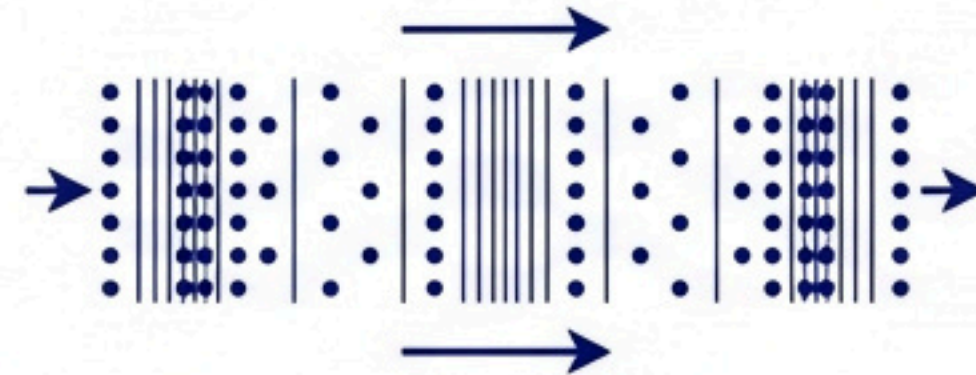
Linear Position ( $x$ )



Angular Position ( $\theta$ )



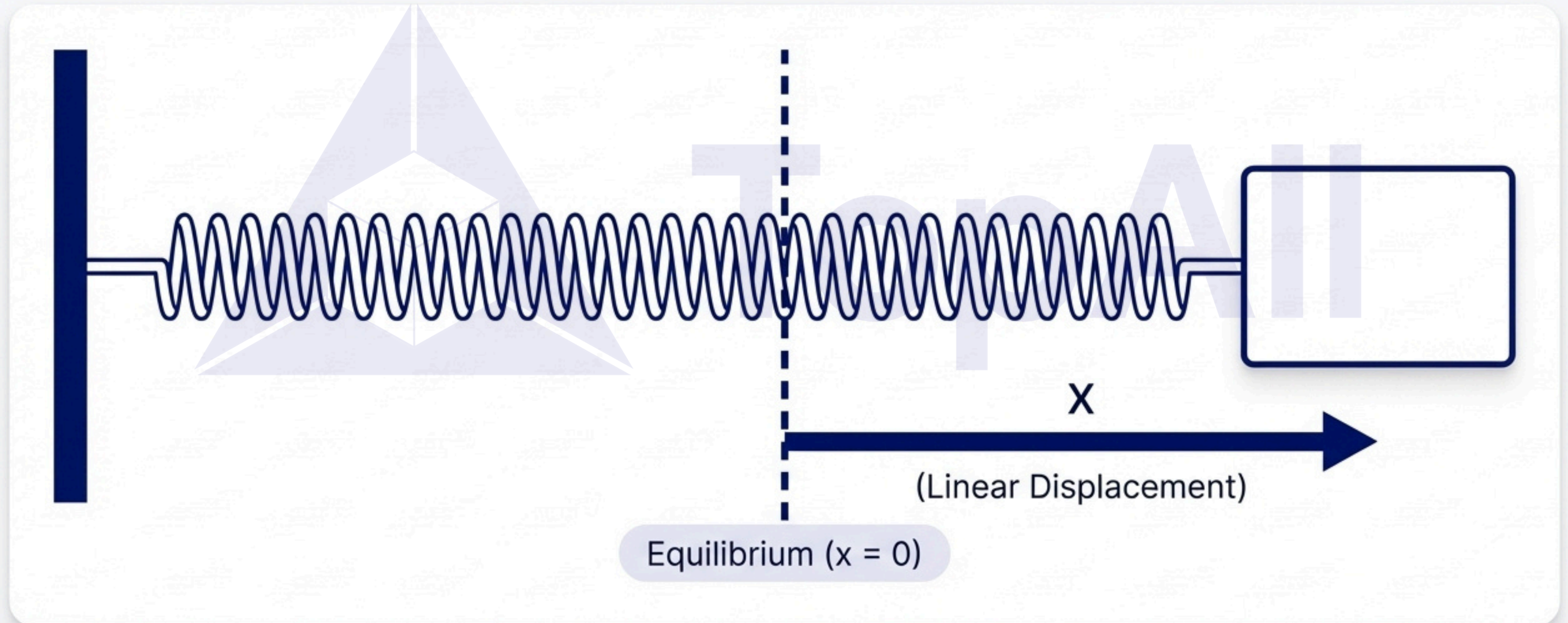
Voltage ( $V$ )



Pressure Variation ( $\Delta P$ )

# H1 Displacement from Equilibrium

We measure displacement from the system's resting state—where the net force is zero.





# You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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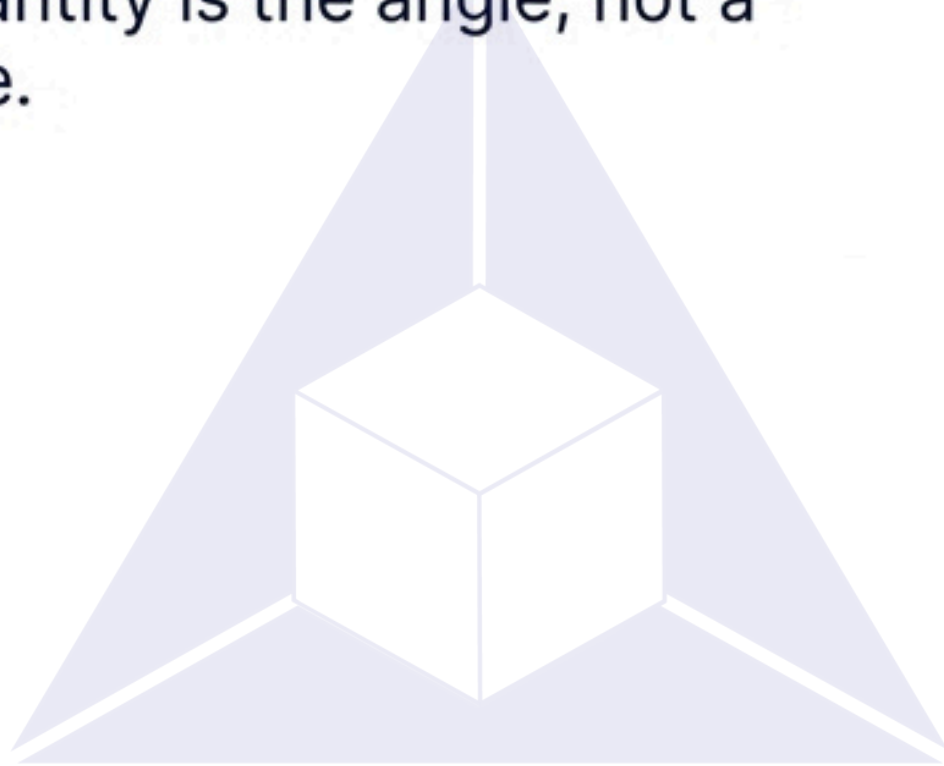
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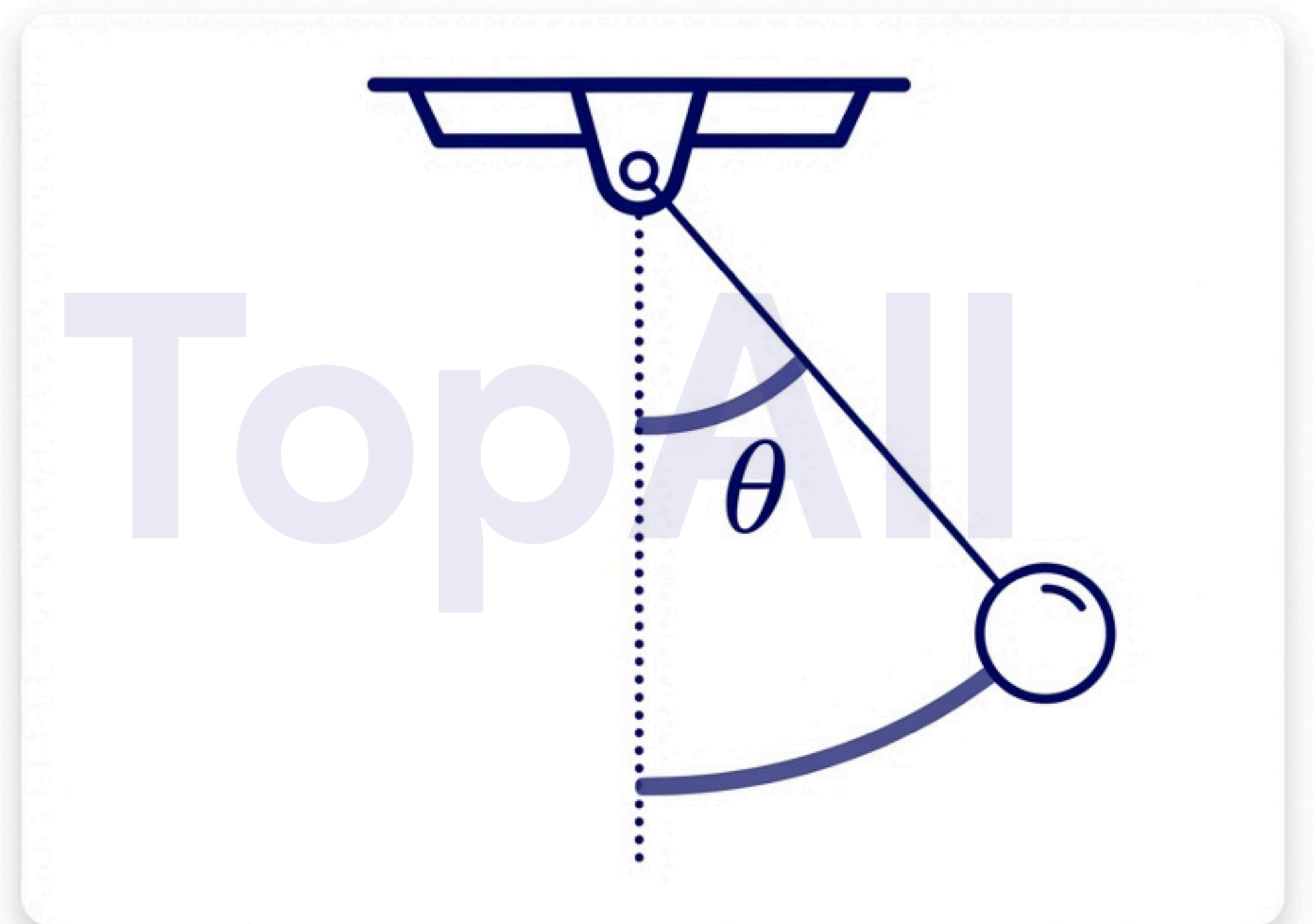


# Angular Displacement

For rotating or swinging systems, the varying quantity is the angle, not a straight line.

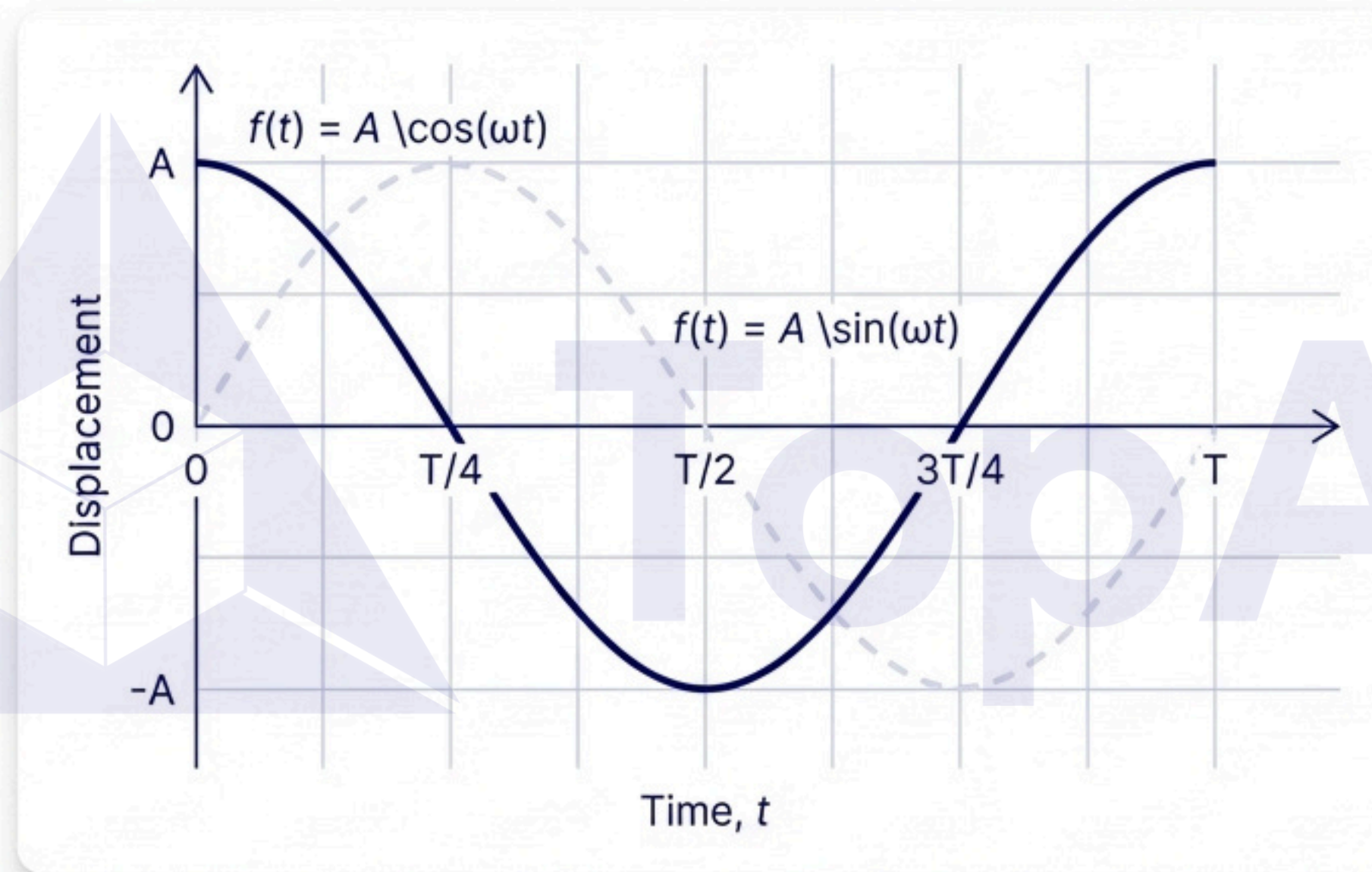


Unlike linear displacement ( $x$  in meters), angular displacement is measured in radians ( $\theta$ ).



# The Mathematical Language of Motion

Because these physical quantities repeat smoothly, they are naturally described by periodic sine and cosine functions.



$$f(t) = D \sin(\omega t + \phi)$$

Adding a phase constant ( $\phi$ ) simply shifts the wave left or right.

# Key Takeaways



**Displacement is the oscillating quantity.** It can be linear position, angle, voltage, or pressure.



**It is measured from equilibrium.** Zero displacement means the system is at its natural, zero-force resting state.



**Sinusoidal functions are the natural language.** Equations like  $A \cos(\omega t + \phi)$  perfectly map the periodic rhythm of the physical world.



# You've Learned the Theory.

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